



# FRBR Review Group initiatives and the world of linked data

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The FRBR Review Group<sup>1</sup> was created by the IFLA Cataloguing Section<sup>2</sup> in 2003 to ensure the ongoing maintenance of the FRBR conceptual model for bibliographic data described in the Functional Requirements for Bibliographic Records final report published in 1998 (*Functional Requirements for Bibliographic Records: Final Report*). The FRBR family of conceptual models also includes the Functional Requirements for Authority Data (FRAD) approved and published in 2009 (IFLA Working Group on Functional Requirements and Numbering of Authority Records (FRANAR)) and the Functional Requirements for Subject Authority Data (FRSAD) approved in 2010 and published in 2011 (IFLA Working Group on the Functional Requirements for Subject Authority Records (FRSAR)). The revised charge of the FRBR Review Group, approved in 2009, includes responsibility for the maintenance and development of all three models, FRBR, FRAD and FRSAD, as well as for their consolidation. The Cataloguing Section *Action Plan for 2012*<sup>3</sup> puts particular emphasis on two tasks being carried out under the responsibility of the FRBR Review Group:

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<sup>1</sup><http://www.ifla.org/en/frbr-rg>.

<sup>2</sup><http://www.ifla.org/en/cataloguing>.

<sup>3</sup><http://www.ifla.org/en/node/1959>.

- FRBR: Explore the preparation of a consolidated document for IFLA's FRBR family of conceptual models in an entity-relationship formulation
- Promote IFLA standards: Participate in the development of namespaces for all IFLA bibliographic standards, including the ISBD, FRBR, FRAD, and FRSAD and in connection with this promote and position the IFLA standards and models in the semantic web

The strategic importance of namespace creation within the overall IFLA development of standards is thus clearly acknowledged.

## **Namespaces for the FRBR family of conceptual models**

The activities on representing IFLA standards and models in RDF started in 2007 following the joint RDA/DCMI Data Model meeting held April 30-May 1, 2007 at the British Library.<sup>4</sup> One of the members of the FRBR Review Group, Barbara Tillett, attended that meeting in her role as a member of the Joint Steering Committee for Development of RDA<sup>5</sup> and saw that the new push towards linked data was just as relevant for FRBR as it was for RDA. At its next annual meeting during the IFLA General Conference in Durban, the FRBR Review Group agreed that it was both appropriate and important that IFLA take a lead in making its models and standards available in an authoritative form for reuse. RDA is based on the

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<sup>4</sup>Data Model Meeting, Outcomes. Available at: <http://www.bl.uk/bibliographic/meeting.html>.

<sup>5</sup><http://www.rda-jsc.org>. The JSC is responsible for maintaining RDA, *Resource Description and Access*.

FRBR and FRAD models, so one option that was under consideration for an RDA namespace was to refer to IFLA FRBR and FRAD namespaces where possible. And so the Review Group decided to start a new project, Namespaces for FRBR entities/elements in RDF, with the specific task being “to define appropriate namespaces for FRBR (entity-relationship) in RDF and other appropriate syntaxes”.<sup>6</sup> At the time the Review Group members did not have the technical expertise required, and sought the assistance of a consultant for the project.

For the FRBR Review Group’s annual meeting during the 2008 IFLA conference in Québec the consultant, Gordon Dunsire, prepared the document *Declaring FRBR entities and relationships in RDF* (Dunsire, *Declaring FRBR entities and relationships in RDF*) which identified as issues:

- the need for a stable, branded, web domain to host the IFLA namespaces,
- that the FRBR Review Group needed to commit to the validation and maintenance of the content of the declarations.

Initial declarations of vocabularies for the FRBR entities, FRBR relationships and FRBR user tasks were carried out in the Open Metadata Registry<sup>7</sup> (prior to 2010 this was called the National Science Digital Library Metadata Registry).

The FRBR Review Group was easily able to validate the labels and scope notes that had been extracted from the (English) text of the FRBR final report. IFLA is a multilingual body, and so opaque URIs were chosen, with the expectation that eventually labels and scope

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<sup>6</sup>FRBR Review Group. Meeting Report, Durban, August 21, 2007. Available at: [http://www.ifla.org/files/cataloguing/frbrg/meeting\\_2007.pdf](http://www.ifla.org/files/cataloguing/frbrg/meeting_2007.pdf), p. 4.

<sup>7</sup><http://metadataregistry.org>.

notes in several languages would be added.<sup>8</sup> However, this was a new type of activity for IFLA and many technical issues remained before the namespaces could actually be published. Around this time other IFLA standards groups, particularly the ISBD Review Group, started expressing an interest in creating their own namespaces (Riva and Willer), and so it became evident that any technical solution for hosting IFLA namespaces had to be designed to be extensible. Gordon Dunsire's report to the FRBR Review Group at the IFLA annual conference in Milan in 2009<sup>9</sup> identified potential requirements for the management of the IFLA namespaces, including making them available in an open environment, providing dereferencing services, and managing them within a common framework. Immediately after the 2009 IFLA congress the base domain [iflastandards.info](http://iflastandards.info) was registered. The same year, at the initiative of the Classification and Indexing Section, the IFLA Professional Committee established an IFLA Namespaces Task Group<sup>10</sup> with Gordon Dunsire as chair. This group proposed the pattern for deriving extended base domains for each distinct namespace.

In <http://iflastandards.info/ns/> the `ns/` segment indicates the namespaces proper, as opposed to any standards documentation which might be made available through the basic <http://iflastandards.info/> site. Adding the segment `fr/` gives <http://iflastandards.info/ns/fr/>, the base for all namespaces relating to the FRBR family of conceptual models. Then, <http://iflastandards.info/ns/fr/frbr/frbrer> is the base for the entity-relationship (ER) namespace for

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<sup>8</sup>Initial translation experiences led to the preparation of the draft guidelines document *Translations of RDF representations of IFLA standards* which was distributed for comment by the ISBD/XML Study Group in April 2012.

<sup>9</sup>FRBR Review Group. Meeting Report, Milan, Italy, August 25 and 26, 2009. Available at: [http://www.ifla.org/files/cataloguing/frbrg/meeting\\_2009.pdf](http://www.ifla.org/files/cataloguing/frbrg/meeting_2009.pdf), p. 3-4.

<sup>10</sup><http://www.ifla.org/en/node/5353>.

FRBR. The classes are sequentially numbered with the letter C as a prefix, for example, [iflstandards.info/ns/fr/frbr/frbrer/C1001](http://iflstandards.info/ns/fr/frbr/frbrer/C1001) is the URI for the entity work. Properties use the letter P as a prefix, for example, [iflstandards.info/ns/fr/frbr/frbrer/P2001](http://iflstandards.info/ns/fr/frbr/frbrer/P2001) is the URI for the is realized through relationship.

Similarly, <http://iflstandards.info/ns/fr/frad> is the base for the FRAD namespace and <http://iflstandards.info/ns/fr/frsad> is the base for the FRSAD namespace.

Since 2009 the FRBR Review Group has been able to concentrate on its responsibility for developing the content of the namespaces, leaving the technical aspects to the Namespaces Task Group.<sup>11</sup> Our intention throughout has been to reflect the full semantics of the FRBR family models as accurately as possible within the tools available. The original IFLA reports were not written with a view to their expression in RDF, and so such essentials as the domains and ranges of relationships are not always stated explicitly and must be deduced. Turning implicit constraints, such as which relationships are transitive, which form reciprocal pairs (inverse properties), which are equivalent (or symmetric), into explicit statements required some thought.

At its August 16, 2010 meeting in Göteborg, Sweden the FRBR Review Group resolved all the outstanding questions raised in the development of a full ontology for FRBRer. The status of the FRBRer element set<sup>12</sup> was set to “published” in May 2011. It contains 10 classes (entities) and 206 properties (attributes and relationships), the additional semantic constraints are expressed in approximately 2000 triples in TTL (terse triple language).

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<sup>11</sup>See the report IFLA namespaces – requirements and options from the IFLA Namespaces Task Group, March 2010, updated February 2011, at: [http://www.ifla.org/files/classification-and-indexing/ifla-namespaces-requirements-options-report\\_corrected.pdf](http://www.ifla.org/files/classification-and-indexing/ifla-namespaces-requirements-options-report_corrected.pdf).

<sup>12</sup><http://metadataregistry.org/schema/show/id/5.html>.

FRBRer declares the 10 classes (the entities) to be disjoint. This semantic constraint is plainly evident from the FRBR final report text, and in general makes logical sense – all would agree that a person is not a place, nor a work, expression, manifestation or item. Their respective FRBR definitions also indicate that a work is not an expression, which is not a manifestation, which in turn is not an item. This implies that any property whose domain is the manifestation must be disjoint from any property with work or expression as its domain. Therefore specific properties must be declared at each level, resulting, for example, in the following declarations to correspond to the relationships defined in FRBR sections 5.3.1.1, 5.3.2.1, 5.3.4.1, and 5.3.6.1:

<http://iflastandards.info/ns/fr/frbr/frbrer/P2057>

**has part (work);**

<http://iflastandards.info/ns/fr/frbr/frbrer/P2079>

**has part (expression);**

<http://iflastandards.info/ns/fr/frbr/frbrer/P2085>

**has part (manifestation);**

<http://iflastandards.info/ns/fr/frbr/frbrer/P2091>

**has part (item).**

This feature of the FRBR model has an impact on the potential for creating formal links between the FRBR properties, particularly those involving FRBR group 1 entities, and conceptually similar properties defined in other namespaces. Unless the FRBRer classes can be mapped to classes in other namespace, the properties cannot be declared as formally equivalent. As many of the ISBD data elements can be aligned intellectually with attributes of group 1 entities in FRBR, and were the historical source of the FRBR attributes, producing a mapping has been articulated as a goal by the ISBD Review Group.<sup>13</sup> However, establishing a formal mapping between the two namespaces is problematic since all properties in the ISBD element

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<sup>13</sup>See goal 3.2 of the Cataloguing Section Action plan for 2012 at: <http://www.ifla.org/en/node/1959>.

set have as their domain the class *resource*<sup>14</sup> which cannot be mapped to any of the FRBRer classes.

In response to suggestions that permitting broader mappings would be useful, the FRBR Review Group has taken some steps towards defining in draft an additional set of unconstrained properties – unconstrained meaning properties without declaration of domains and ranges – which could serve as superproperties of the FRBRer properties. Thus one possible approach to creating linkages with element sets such as ISBD could be aligned at this general level.

Developing namespaces for FRAD and FRSAD followed the work on the FRBRer namespace, and all outstanding issues were resolved at the Review Group's August 19, 2011 meeting in San Juan, Puerto Rico. The FRAD element set<sup>15</sup> consists of 12 classes and 134 properties, with 600 TTL triples to express the semantic constraints. The FRSAD ontology<sup>16</sup> is the smallest, with only 2 classes and 17 properties making up the element set and 60 TTL triples to express the constraints. Both FRAD and FRSAD refer to some elements already defined in FRBRer, these linkages are also expressed as TTL triples. The status of the FRAD and FRSAD namespaces was set to “published” in February 2012.

This work has taken longer than initially imagined, but as of March 2012, all the FRBR family namespaces in the Open Metadata Registry are providing dereferencing services to the individual class and property level (Riva, “Functional Requirements namespaces published”). This enhancement to the OMR was funded by the FRBR Review Group.

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<sup>14</sup>The class *resource* is defined as: «An entity, tangible or intangible, that comprises intellectual and/or artistic content and is conceived, produced and/or issued as a unit, forming the basis of a single bibliographic description». <http://metadataregistry.org/schemaprop/show/id/2107.html>.

<sup>15</sup><http://metadataregistry.org/schema/show/id/24.html>.

<sup>16</sup><http://metadataregistry.org/schema/show/id/26.html>.

## Aggregates Working Group report

The Working Group on Aggregates was formed in 2005 and submitted its final report on September 12, 2011 (IFLA Working Group on Aggregates). It describes three categories of aggregates: aggregate collections of expressions, aggregates resulting from augmentation, and aggregates of parallel expressions, and provides well-chosen examples of each. When the Working Group was first constituted, the expectation was that it might recommend an amendment to FRBR to clarify the treatment of aggregates. However, as the FRBR Review Group has begun working on a consolidation of the models, the report will be considered in the context of the consolidation project.<sup>17</sup>

## Consolidation

The FRBR Review Group's priority activity is the production of a consolidated statement of the conceptual models in the FRBR family. Having three documents written over such a long period of time and by different working groups (two of which functioned concurrently) is inconvenient for application development as there is no official statement of the interrelationships between the models. The three reports reflect different approaches and the evolution of thinking over time. This is evident just in the names of the models: FRBR includes the word records in its name, but actually models data; the model initially named FRAR (Functional requirements for authority records) was renamed FRAD (Functional requirements for authority data) to reflect this realisation. Of the three models, FRSAD takes

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<sup>17</sup>FRBR Review Group. Meeting Report, San Juan, Puerto Rico, August 15, 2011. Available at: [http://www.ifla.org/files/cataloguing/frbrg/meeting\\_2011.pdf](http://www.ifla.org/files/cataloguing/frbrg/meeting_2011.pdf). Item 6.2 on p. 4.



the most general approach, FRAD the most detailed. Some of the intended interrelationships are obvious, for instance, the entity family defined in FRAD is clearly intended to function as an agent along with the FRBR group 2 entities person and corporate body, and thus any relationship that can involve person or corporate body should be extended to family. By forcing the FRBR Review Group to carefully examine each entity, attribute and relationship defined by the three models to select appropriate domains and ranges for the properties, and to make explicit any implicit constraints and explicitly declare the intended semantics of the properties, the development of the namespaces has definitely laid important groundwork for the consolidation process (Dunsire, “Interoperability and semantics in RDF representations of FRBR, FRAD and FRSAD”; “Representing the FR family in the Semantic Web”). The process of developing the namespaces also highlighted areas which pose particular challenges in the consolidation process. The treatment of subjects is one of these; the concept of “having a subject” is viewed as a relationship in FRBR and FRSAD, but as an attribute of the entity *work* in FRAD (“Subjects in the FR family”). Another complex area is the treatment of names. FRAD defines three interrelated entities name, identifier, controlled access point; FRSAD just defines a single entity nomen, which might be viewed as a superclass of the three FRAD entities. Examining the attributes of these entities highlights the importance of the context of the name use (Doerr, Riva, and Žumer), and this in turn offers some insight into the FRAD definition of person as a bibliographic identity, or a name that a real person uses in a specific context. At its most recent working meeting on April 25, 2012 (Riva, “Report from the FRBR Review Group mid-year meeting”), the FRBR Review Group concluded that the aim of the consolidation process should be to define a coherent model of the bibliographic universe. This is to be done using the three existing models, as well

as the Aggregates report and insights from the development of the namespaces and FRBRoo, but that a fresh approach to certain issues can be taken when warranted. Some of the conclusions reached so far include the intention to retain the FRSAD general model of the subject relationship, with no detailed typology of subject entities, which results in the decision to functionally deprecate the FRBR group 3 entities, concept, object, event, place. To provide guidance in the consolidation the Review Group started with an examination of the users and user tasks as defined in the three models. The proposed combined user tasks is as follows:

**Find.** To search on any relevant criteria in order to bring together information about one or more resources of interest

**Identify.** To determine the suitability of the resources found and to distinguish between similar resources

**Select.** To choose (by accepting or by rejecting) specific resources

**Obtain.** To access the content of the resource

**Explore.** To use the relationships between one resource and another to place them in a context

The Review Group intends to simultaneously produce a textual description of the consolidated model and to declare it as a namespace. This will require careful indication of versions for any classes and properties whose semantics are changed. Following IFLA's normal procedures for such documents, the draft descriptive text will be made available for world-wide review and the comments received resolved by the FRBR Review Group, prior to recommending its approval by the Cataloguing Section.

## FRBRoo

The discussion so far has referred entirely to the FRBR conceptual models in their original “classic” entity-relationship formulation. In parallel with these developments, in 2003 the FRBR Review Group formed a joint working group<sup>18</sup> with the International Council of Museum’s Committee on Documentation (CIDOC) CRM Special Interest Group,<sup>19</sup> with the goal of preparing an object-oriented statement of FRBR as a compatible extension (Riva, Doerr, and Žumer) of the CIDOC CRM (Conceptual Reference Model).<sup>20</sup> FRBRoo version 1.0<sup>21</sup> was approved and published in January 2010. The focus of the four meetings since then has been to include the entities, attributes and relationships defined in FRAD and FRSAD in FRBRoo.<sup>22</sup> The most recent meeting was 30 April-3 May 2012 in Heraklion, Crete, Greece. Version 2.0 of FRBRoo is now close to completion and will be released for comment. An RDF representation of FRBRoo version 1.0.2 exists but not in the Open Metadata Registry, current plans are to import FRBRoo version 2.0 into the OMR as soon as the bulk import feature is available.

As with any translation process, these cross-community alignment discussions have revealed unstated assumptions, imprecise definitions, apparent inconsistencies and a myriad other issues and ideas, all of which are providing valuable input into the FRBR Review Group’s consolidation process.

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<sup>18</sup><http://www.ifla.org/en/node/928>.

<sup>19</sup>[http://www.cidoc-crm.org/who\\_we\\_are.html](http://www.cidoc-crm.org/who_we_are.html).

<sup>20</sup>[http://www.cidoc-crm.org/definition\\_cidoc.html](http://www.cidoc-crm.org/definition_cidoc.html).

<sup>21</sup>[http://www.cidoc-crm.org/docs/frbr\\_oo/frbr\\_docs/FRBRoo\\_V1.0.1.pdf](http://www.cidoc-crm.org/docs/frbr_oo/frbr_docs/FRBRoo_V1.0.1.pdf).

<sup>22</sup>Meeting minutes available at: [http://www.cidoc-crm.org/special\\_interest\\_meetings.html](http://www.cidoc-crm.org/special_interest_meetings.html).

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**ABSTRACT:** The FRBR Review Group has the mandate to review and maintain IFLA's family of conceptual models and to develop guidelines and interpretive documents to assist in the application of the models. In September 2011 the Aggregates Working Group submitted its final report, clarifying the modeling of three distinct types of aggregates within an FRBR framework. Since the approval of the FRSAD model in 2010, the FRBR Review Group has been concentrating its efforts on the development of a consolidated statement of the three models (FRBR, FRAD, FRSAD) in the entity-relationship formalism. The interrelationships between the models are particularly illuminating with regards to the subject entities and relationships and the "naming" entities. In parallel, the FRBR/CIDOC CRM Harmonisation Working Group has been working to extend FRBRoo to include the entities, attributes and relationships defined in FRAD and FRSAD. A third essential aspect of the FRBR Review Group's work is the development of a series of namespaces for the entities, relationships, attributes and user tasks as defined in the three models. This process has raised a number of interesting questions and often clarifies the underlying semantics of the models.

**KEYWORDS:** Library linked data; Semantic web; RDF

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